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THE DEGENERATION OF YOLK GLANDS AND CELLS IN CESTODES.

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Yolk glands, while frequent, are not of universal occurrence in flat worms, nor do they apparently bear any constant relation to the systematic position of the various groups of this phylum. In the Acœla, which are probably to be regarded as the most primitive of the latter, they are lacking, with the exception of *Polychœrus*, while the same is true of the polyclads, which are one of the more specialized of these groups.[1]

Among trematodes they are universally present with the exception of *Gyrodactylus*, where their absence is possibly correlated to the peculiar mode of reproduction, while in cestodes they are typically present, though reduced in some and in one case at least absent.

Braun[2] in his description of the yolk glands in this class has pointed out their gradual reduction in size from those such as *Tetrarhynchus tetrabothrius*, in which the gland forms a mantel around the entire proglottid, to those such as many Tæniæ, where the gland is reduced to a small unpaired organ adjacent to the ovary. It is this reduction of yolk glands in some cestodes, together with certain corollaries deducible therefrom, that I wish to discuss briefly in this note.

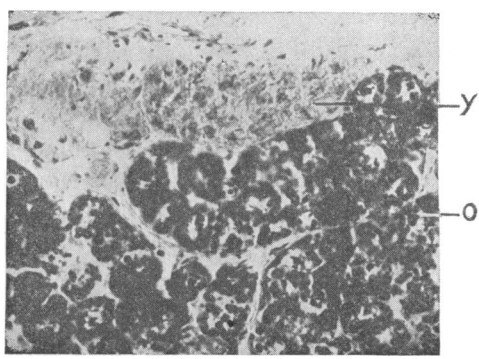
In a study of gametogenesis in cestodes upon which I am

[1] This last statement holds good even though the polyclads be considered as directly derived from the ancestral form. If the Acœla however be regarded as degenerate, rather than primitive types, then the absence of a yolk gland here may be attributed to such degeneracy. This would not explain their presence in *Polychœrus* however, nor their absence in *Gyrodactylus*, which is exceptional among trematodes in this respect.

[2] Braun, M., "Cestodes" in Braun's Kl. and Ord. IV., Ib.

engaged, I have examined the reproductive apparatus of a number of species, in one of which I am unable to discover a yolk gland, while in another I find evidence of its degeneration. The species in which this organ is evidently lacking is *Thysanosoma actinoides*. A yolk gland in this species was described by Stiles and Hassall in 1893.[1] Their work was done, however, on material which they expressly state was in such poor condition that many details could not be worked out. In a study of the reproductive organs in this form Swingle[2] was unable to find a yolk gland, nor can I do so. Therefore I believe that the former authors were misled, mistaking possibly a posterior lobe of the ovary for a yolk gland.

In *Hymenolepis* sp., I find evidence of the degeneration of



Yolk gland (*Y*) and ovary (*O*) of *Hymenolepis* sp. × 500.

the yolk gland, for here not only is the gland reduced in size, but it contains no yolk. Yolk takes iron hæmatoxylin with avidity, so that if present in the yolk cells it should appear with this stain, as it does very clearly in the ovary, whose cells are heavily laden with it. In the figure is brought out very clearly the distinction between the yolk filled ova and the empty yolk cells. This is true at least of later stages of the gland. In earlier stages the densely crowded and heavily staining nuclei

[1] Stiles, C. W., and Hassall, A., "A Revision of the Adult Cestodes of Cattle, Sheep and Allied Animals," U. S. Dept. Agric., Bur. An. Ind., Bulletin No. 4.

[2] Swingle, L. D., "The Morphology of the Sheep Tapeworm, *Thysanosoma actinoides*," University of Wyoming, Agric. Exp. Station, Bulletin No. 102.

render it impossible to say that no yolk is present at this time. It is not evident at this time however nor is its presence to be expected in early stages of the yolk gland, before any considerable differentiation of its cells has taken place. The nucleus of the adult yolk cell apparently offers further evidence of degeneration for it is very irregular and broken in form and contains but little chromatin, though how much of this appearance is natural and how much artificial, due to imperfect action of the fixative on exceedingly plastic structures, I cannot say. In earlier stages however the yolk cell nuclei are fairly definite structures in similarly fixed material, so I incline to the belief that their irregular appearance in later stages is due to degeneration.

I have pointed out above that there is little constancy in the occurrence of a yolk gland in flat worms. It may exceptionally be present in some form in a group, where otherwise it is absent, and vice versa. The fact that it is almost certainly to be regarded as a specialized part of the ovary, and that its function may be largely assumed by the latter even when it is present, as in cestodes, reduces its functional importance and consequently its selective value, and may therefore increase its variability and render it more liable to degeneration.

In cestodes the function of the yolk gland has been largely supplanted by the ovary itself, and its absence in one, and apparent degeneration in another species may very likely be prophetic of its future degeneration in cestodes as a group, together with so many other organs.

A further point of interest in connection with these observations is the fact that in *Thysanosoma actinoides*, where a yolk-gland is absent, the cell so frequently attached to the ovum and embryo, which has been assumed by several writers to be a polar body, is likewise absent; which is a further argument to be added to those already presented by me[1] for considering this cell a yolk cell rather than a polar body.

[1] Young, R. T., "The Histogenesis of the Reproductive Organs of *Tænia pisiformis*," *Zool. Jahrb.*, XXXV., 355–418.